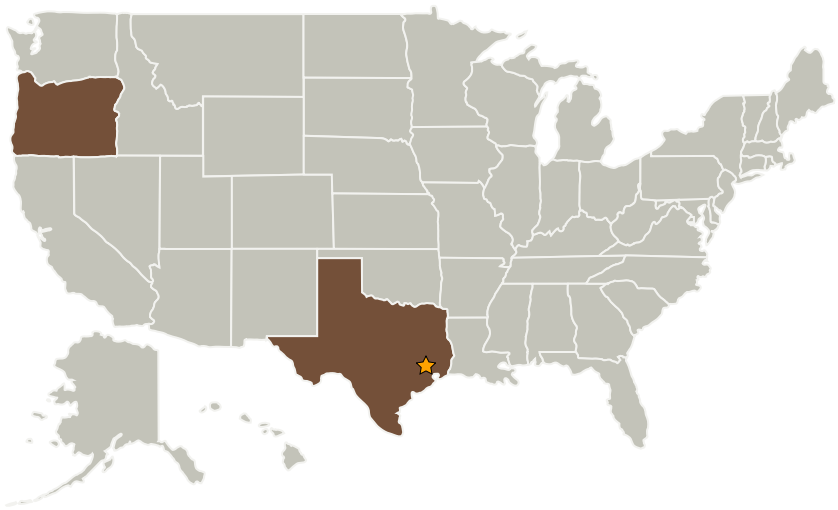
Nonhazardous Urine Pretreatment Method for Future Exploration Systems, Phase II

Completed Technology Project (2009 - 2011)

Project Introduction

A nonhazardous urine pretreatment system prototype is proposed that will stabilize urine against biological growth or chemical instabilities without using hazardous chemicals. Untreated urine fosters biological growth, ammonia off-gassing, creation of bio-solids, and inorganic precipitates, which foul water and air reclamation hardware. The current Russian system employs hexavalent chromium, a strong oxidant and carcinogen, and sulfuric acid to stabilize urine (pH=1.8), while the future American system utilizes Oxone®, a strong oxidant, potassium hydrogen sulfate, and potassium benzoate to stabilize urine (pH=2.4). Urine stabilized by these methods requires triple and double containment, respectively. Chemical storage, handling, and delivery of pretreatment chemicals are also problematic due to their hazardous nature and low pH, which significantly increases Equivalent System Mass. The proposed prototype will utilize non-oxidizing biocides in combination with nontoxic and noncorrosive solid phase urine acidification to stabilize urine at much higher pHs (3.6-5.5). This approach has stabilized urine effectively for over 57 days during the Phase 1 program. The innovative prototype will fulfill an unmet need for safe, efficient, automated urine pretreatment for current and future NASA missions. The Phase 2 project will automate the nonhazardous urine pretreatment system, and deliver a fully functional Prototype suitable for testing at NASA facilities.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
UMPQUA Research Company	Supporting Organization	Industry	Myrtle Creek, Oregon

Primary U.S. Work Locations	
Oregon	Texas

Project Transitions

February 2009: Project Start

February 2011: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.1 In-space Propellant Storage & Utilization